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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/043,027	01/09/2002	Jeong-hee Chung	5649-917	6119

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MYERS BIGEL SIBLEY & SAJOVEC
PO BOX 37428
RALEIGH, NC 27627

EXAMINER

VESPERMAN, WILLIAM C

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 06/05/2003

6

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/043,027

Applicant(s)

CHUNG ET AL.

Examiner

William C. Vesperman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 03 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 1/092002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 1/092002 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☒ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

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DETAILED ACTION

1. This action is in reply to applicant's filed application of January 9, 2002.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claim 1 is rejected under 35 U.S.C 102(b) as being anticipated under Korean Patent Application 10-1998-0045871 (Publication Date of May 15, 2000).

Samsung Electronics Co., teaches (Abstract, Figures 1 - 6) a method of forming an integrated circuit capacitor, comprising: forming a lower electrode on a substrate; forming a metal preprocessed layer of aluminum oxide on the lower electrode using chemical vapor deposition in which a metal precursor is used as a source gas and the metal precursor comprises oxygen; forming a tantalum oxide dielectric layer on the metal preprocessed layer; and forming an upper electrode on the dielectric layer.

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4. Claims 1, 2, 5, 6, 12 and 21 are rejected under 35 U.S.C. 102(e) as being anticipated by Nam et al. (US 6,207,489).

In regards to Claim 1, 2, 5 and 12, Nam et al. discloses (Figures 5A – 5F, columns 6 –8, lines 60 –60) a method of forming an integrated circuit capacitor, comprising: forming a lower electrode (20) on a substrate (10); forming a metal preprocessed layer (22) on the lower electrode (polysilicon) using chemical vapor deposition in which a metal precursor (Ta) is used as a source gas and the metal precursor comprises oxygen; forming a tantalum oxide dielectric layer (30) on the metal preprocessed layer; and forming an upper electrode (50) on the dielectric layer.

In regards to Claim 6, Nam et al. discloses (columns 7, lines 35 – 40) the metal precursor comprises a material selected from a group of materials consisting of a metal alkoxide such as $\text{Ta}(\text{OC}_2\text{H}_5)_5$ or Ta such that the flow rate of the source gas as well as the temperature are factors which all affect the electrical characteristics of the formed layer.

In regards to Claim 21, Nam et al. discloses (columns 8, lines 35 - 40) an upper electrode formed of polysilicon.

The applied reference has a common assignee with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the

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inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 3, 4, 7, 8, 9, 10, 11, 13, 14, 16, 17, 18, 19, 20, 22, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nam et al. (US 6207489 B1) in view of Kang et al. (US 2002/0006708 A1).

In regards to Claims 3 and 22, Nam et al. discloses all the limitations of the claims except does not disclose that the lower electrode's noble metal is Ru or Pt or Ir.

Kang et al. discloses (Abstract) that a capacitor's lower electrode comprises of Pt.

It would be obvious to one skilled in the art, at the time of the invention, to combine the teachings of Nam et al. and Kang et al. in order to modify the process as taught by Nam et al. and incorporate Pt as the noble metal for the lower electrode as taught by Kang et al.

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One would be motivated to incorporate Pt as the noble metal for the lower electrode as taught by Kang et al. since Pt is a recognized metal for use as a lower electrode for a capacitor.

In regards to Claims 4 and 23, Nam et al. discloses all the limitations of the claims except does not disclose that the electrode's metal nitride is titanium nitride, tantalum nitride or tungsten nitride.

Kang et al. discloses (paragraph 00487) that a capacitor's lower electrode comprises of titanium nitride,

It would be obvious to one skilled in the art, at the time of the invention, to combine the teachings of Nam et al. and Kang et al. in order to modify the process as taught by Nam et al. and incorporate the titanium nitride for the lower electrode as taught by Kang et al.

One would be motivated to incorporate titanium nitride for the lower electrode as taught by Kang et al. since titanium nitride is a recognized metal for use as a lower electrode for a capacitor.

In regards to Claims 7, 9, 10, 11, 13, 14, 15, 16, 18, 19 and 20, Nam et al. discloses (columns 6 - 8, lines 1 - 60) all the limitations of the claims including: placing the substrate into a reaction chamber; introducing a metal source gas (Ta) into the reaction chamber using CVD methodology; adsorbing the metal source gas Ta or Ta(OC₂H₅)₅ in the lower electrode; introducing an oxygen or mixture of oxygen and N₂O source gas into the reaction chamber at a pressure of 0.1 torr; adsorbing the oxygen source gas in the lower electrode; and reacting

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at a temperature of 350 – 800 degrees the adsorbed metal source gas with the adsorbed oxygen source gas to form a dielectric metal oxide (TaO_2) layer (30).

Nam et al. does not teach purging the metal resource gas from the reaction chamber using argon or nitrogen.

Kang et al. teaches (Figure 1) purging the previous source gas in the reactor before supplying a new source gas using argon or nitrogen.

It would be obvious to one skilled in the art, at the time of the invention, to combine the teachings of Nam et al. and Kang et al. in order to modify the process as taught by Nam et al. and incorporate the step of purging the previous source gas in the reactor using argon or nitrogen before supplying a new source gas as taught by Kang et al.

One would be motivated to incorporate the step of purging the previous source gas in the reactor using argon or nitrogen before supplying a new source gas as taught by Kang et al. in order to minimize contaminating the process as taught by Nam et al. due to the presence of the previous source gas. In addition, one would be motivated to use argon or nitrogen in order to purge the previous source gas since these are considered to be non-reactive inert gases, thereby reducing the generation of any reactive gas products.

In regards to Claims 8 and 17, Nam et al. and Kang et al. disclose the claimed invention except do not teach a flow rate of the metal precursor during deposition to be about 1 – 2000 sccm. It would have been obvious to one of ordinary skill in the art at the time of the invention was made to specify a flow rate

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of the metal precursor during deposition, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. In re Aller, 105, USPQ 233. (CCPA 1955)

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kang (US 6,372,598 B2) teaches a method of forming a selective metal layer on a capacitor.

Lee et al. (US 6,218,260 B1) teaches methods of forming integrated circuit capacitors.

Joo et al. (US 2002/0100959 A1) teaches a capacitor and a memory device.

Lee et al. (US2001/0001501 A1) teaches integrated circuit capacitors having doped electrodes.

Joo et al. (US 6,376,299 B1) teaches a capacitor for a semiconductor memory device.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to William C. Vesperman whose telephone number is 703-305-1939. The examiner can normally be reached on Mon. - Fri., 8:00 - 4:30.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 703-308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

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May 30, 2003

Carl Whitehead, Jr.
CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800